EVAPORATIVE CONTAINER FOR VOLATILE SUBSTANCES

Background of the Invention

This invention relates to a container from which volatile substances such as insecticides and/or aromatics are evaporated by means of an evaporating device.

Containers for substances evaporated by means of an evaporating apparatus are generally known and commonly used such as containers which are screwed or snapped into a housing of the evaporation apparatus. The container comprises a wick with one end dipping into the volatile substance and an opposite end which extends out of the container. The wick end may also extend into a suitable wick opening of a heating element of the evaporation device for heating. The volatile substance is drawn out of the container by the capillary effect so that the substance is evaporated by the heat from the heating element. The heating element may be in the form of a ceramic block. The substance is able to emerge into the environment through ventilation slits in the housing of the evaporation apparatus. The evaporation device is commonly used for the evaporation of volatile substances, such as insecticides and/or aromatics, in closed rooms of apartments or homes.

One problem with prior evaporation systems is that the volatile substances, particularly in the case of pesticides, can in large quantities be dangerous to the health of humans and in particular of children. For example, when the wick is pulled too far out of a full container a greater quantity of the volatile substance becomes accessible which can be spilled. In addition there is a danger, once a container is empty, that a user might fill up the container with a volatile substance that is flammable, and not suitable for use in the evaporation device. A danger may also exist if an empty

container is filled with a insecticide that may not be suitable for evaporation in enclosed spaces due to its high toxicity.

In order to prevent these dangers, a container for volatile substances in an evaporation device has been proposed in United States Patent 6,236.807. The proposed container includes a container neck extending from the container having a container opening. A wick retaining insert is inserted into the container opening of the neck which is made as a cylindrical insert sleeve. The sleeve is provided with a holding insert and wick opening for the insertion of the wick. An outside wall of the holding ring insert contacts an inside wall of the container neck at least in some areas. This container furthermore comprises a wick-fixing device by means of which the wick is secured when inserted against being pulled out of the container neck. In practice, the wick-fixing device is provided in accordance with the present invention by a needle inserted radially into the container below the wick retaining insert. The inserted needle penetrates through the wick with two opposite needle ends radially extending from the wick. The wick retaining insert is pressed into the container opening of the container neck by means of a press fit so that if an attempt is made to pull the wick out of the container, the needle engages a lower end of the wick retaining insert providing resistance against the pulling out of the wick. The structure must be designed so that the resistance to the pulling out of the wick meets local ordinances, e.g., a United States ordinance recommending a minimum resistance force of 15 lbs.

However, a problem exists with the prior wick-fixing needle in that the needle is inserted initially through a dry wick made up of a fiber material. When the wick is wet by the volatile substance the wick is softened so that the needle may possibly become

loose and detached form the wick. The insertion of the wick is no longer ensured. This is a temporary solution that is not sufficient for the requirements of high quality containers.

It is therefore an object of the present invention to provide a container for volatile substances in which a wick is effectively inserted and retained in the container so that accidental removal of the wick is prevented.

Summary of the Invention

The above objectives are accomplished according to the present invention by providing a container having a wick retaining insert. The wick can be inserted through a wick opening of the wick retaining insert when the wick is not in the container. A clamping connection between the container neck and insert is designed so that the clamping connection causes the wick to be clamped against an inside wall area of the wick retaining insert and prevents it from being puled out when the wick retaining insert is inserted in the opening of the container neck.

The high quality clamping of the wick in the container can be produced easily with good functional reliability. This is achieved in particular by clamping the wick against an inner wall of the wick retaining insert. The clamping connection is formed by existing components so that no separate components have to be provided and the number of components can be reduced. In addition, a flatter clamping of the wick can be achieved for a good and reliable retention.

The retention power of the clamping connection is designed to resist pulling out of the wick. The snap-in force of the wick retaining insert is coordinated to prevent pulling out of the wick together with the wick retaining insert.

The resistance force opposing the pulling out of the wick retaining insert is preferably greater than the clamping power applied by the clamping connection to the wick. In principle, however, the resistance force opposing the pulling out of the wick retaining insert could also be less than the resistance force opposing the pulling out of the wick from the wick retaining insert.

A clamping connection with at least two different diameter zones is preferred so a deformable wick retaining insert clamping zone is provided. The wick retaining insert can be deformed radially along its clamping zone in the direction of the wick as the distance over which the wick retaining insert is inserted increases, so as to clamp the wick securely along the inside wall zone of the wick retaining insert. An actual construction of this type can be realized easily by making the wick retaining insert of a plastic material by extrusion. The deformation of the clamping zone is preferably elastic, i.e., with a return to initial position. In principle, plastic deformation would also be possible, since no re-use of the wick retaining insert is intended or desired. Alternatively, however, other materials or combinations of materials for the wick retaining insert can be used insofar as they are suitable to ensure a deformation of the clamping zone in the described manner.

In an advantageous embodiment, the different diameter zones, at least two, are formed on the inside wall of the container neck. One diameter zone is close to the container opening and another diameter zone is formed in the container neck close to the container body which has a smaller diameter. The clamping zone of the wick retaining insert fits with the different clamping zones on the inside container neck wall so that the insert is deformed radially against the wick to clamp it securely in passing

from one diameter zone to the other. Forming the different diameter zones on the inside container neck wall is especially easy and inexpensive to make, especially where glass containers are used. Furthermore, fitting the insert to the inside container neck wall is especially simple when the wick retaining insert is made of an extruded plastic material. In this manner, reliable and advantageous clamping of the wick is ensured preventing it from being pulled out of the container.

While the different diameter zones could, in principle, be conical, this is somewhat more expensive in manufacturing technology. Preferably, the different diameter zones are created by means of radially surrounding steps along the inside container neck so that a greater diameter zone is created above, and a smaller diameter zone below. For easy introduction of the wick retaining insert, an extrance bevel in the direction of the lower, smaller diameter zone can be formed in the area of the steps. This results in an especially high quality construction through which the clamp connection according to the invention can be realized very easily and reliably secure against the wick pulling out.

The wick retaining insert can be provided with a surrounding shoulder at one end that presses against the upper edge of the container opening of the container neck when inserted. This ensures in a simple manner that the wick retaining insert can always be inserted correctly.

In another advantageous aspect of the invention, at least one snap-in element is provided on the outside wall of the wick retaining insert. The snap-in element interacts with a complimentary snap-in element on the inside container neck wall to secure the wick retaining insert in the container neck. This snap-in connection can be

established easily by pressing the wick retaining insert into the container opening of the container neck. The snap-in element is preferably formed on the outside wick retaining insert wall in form of at least one circumferential snap ring, and an inside neck wall by a complimentary shaped snap-in groove. With such a design it is possible to achieve a secure connection between the wick retaining insert and the container neck.

In an advantageous embodiment, the wick retaining insert clamping zone includes at least two clamping fingers extending in the direction of a longitudinal wick retaining insert axis. The fingers are radially separated by a gap. The gap between adjacent holding fingers provides sufficient clearance for a radial deformation of the holding fingers in the direction of the wick to clamp the wick. The holding fingers are preferably elastic and return to their original positions.

Especially reliable and secure clamping of the wick is ensured when at least one protrusion-like step is provided on the inside insert wall. This step is pushed into the wick in the manner of a mandrel when the clamping area is deformed in the direction of that wick. The edge of the step is pressed into the wick and the wick is clamped. In a preferred embodiment, the clamping steps of adjoining clamping fingers are offset relative to each in the longitudinal direction of the wick retaining insert. Preferably, every second clamping step is approximately at the same level when a plurality of clamping fingers are used. This offset produces even distribution of the clamping power along the wick. These clamping steps achieve an especially advantageous clamping in the manner of counter-hooks. The clamping steps can in principle be of different designs. However, a design where the gradation decreases from the inside to the outside is preferred.

To be able to insert the wick easily and comfortably through the insert when not inserted into the container opening, at least one radially surrounding entrance bevel is provided in the insert along the longitudinal direction of the insert. Similarly, an entrance bevel can be formed at one end of the wick retaining insert for its insertion into the container opening of the container neck.

In principle the wick retaining insert and its associated container opening may be given a round, angular, or similar cross-section. However, a design in which the wick retaining insert, and the container opening have a circular cross-section is preferred for favorable geometries and simple manufacture of the components.

In another advantageous aspect of the invention, threads are formed on an outside wall of the container neck so that a locking cover can be screwed onto the container neck. Thus, a separate salable unit is produced which can be used, e.g., in different types of evaporation devices. The locking cover provides protection for the wick protruding from the container.

As has been originally explained in connection with the known state of the art, a completely assembled container can be coupled to an evaporation device so that the wick is located with one wick end in the area of a heating arrangement. In an especially preferred manner the container can be screwed into a housing of the evaporation device, preferably by using the threads formed on the outside wall of the container neck for the locking cover. The wick end extends into a wick opening of a heating block of the heating arrangement when the wick end is assembled.

The container body can have geometry, i.e., it can be round, cylindrical, pyramid shaped, etc., with the container being preferably made of a glass material and/or a plastic material.

Description of the Drawings

The construction designed to carry out the invention will hereinafter be described, together with other features thereof.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawings forming a part thereof, wherein an example of the invention is shown and wherein:

Figure 1 is a schematic cross-section view illustrating a locking cover for a container, according to the invention;

Figure 2 is a schematic side view of a container, according to the invention;

Figure 3 is a schematic top view of the container of Figure 2, according to the invention;

Figure 4 is a schematic enlarged cross-section illustrating a wick retaining insert that can be pressed into a container opening of a container neck and is designed in form of a cylindrical sleeve, according to the invention;

Figure 5 is a schematic enlarged top view illustrating the wick retaining insert of Figure 4;

Figure 6 is a schematic enlarged view from below illustrating the wick retaining insert of Figure 4; and

Figure 7 is a schematic enlarged cross-sectional view illustrating a partial section of a completely assembled container in which a clamping connection holds the

wick inserted through the wick retaining insert clampingly against an inside wick retaining insert zone and secures it against being pulled out, according to the invention.

Description of a Preferred Embodiment

Referring now in more detail to the drawings, the invention will now be described in more detail.

Figure 1 schematically shows a side view of a container 1 for substances to be evaporated by means of an evaporation device (not shown) such as insecticides and/or aromatics. Figure 3 shows a schematic top view of container 1 of Figure 2. Container 1 is preferably made of a glass material.

As can be seen in Figures 2 and 3, container 1 has a container body 2 which can contain a volatile substance. A container neck 3 extends from container body 2 and a container opening 4 is formed in the neck. The form of the container body 2 is chosen here merely as an example. In principle, the container body 2 can be designed with any desired and required geometries.

As can be seen, especially in Figure 2, the container neck 3 has an outside wall 5 with threads 6, so that a locking cover 7, shown schematically in Figures 1 and 7, can be screwed on container neck 3 in the assembled state of container body 2.

Figure 4 shows an enlarged, schematic cross-sectional view of a wick retaining insert 8 that can be pressed into the container opening 4 of the container neck 3 and is made in the form of a cylindrical sleeve. This wick retaining insert 8 is completely traversed by a wick passage 9 through which a wick 10 (Figure 7) can be inserted. Figure 5 shows a corresponding enlarged schematic top view of wick retaining insert 8, while Figure 6 shows a schematic view from below.

As can be seen in Figures 4 through 6, wick retaining insert 8 is provided at one end with a surrounding insert shoulder 11 which lies on an edge 12 of container opening 4, as can be seen in Figure 7. As can further be seen in Figures 4 and 7, there are three radially circumferential snap-in rings 14 spaced from each other in a longitudinal direction. The snap-in rings mesh with or snap into complimentary snap-in grooves 16 formed in the interior of container neck 6 when wick retaining insert 8 is inserted, as shown in Figure 7. In that case wick retaining insert 8 is preferably pressed into the container opening 4 of the container neck 3 with a press fit at least in some areas. A contact connection is provided by the snap-in connection constituted by snap-in rings 14 and snap-in groove 16 which provides additional safety against pulling out the wick retaining insert 8 from the container opening 4.

As can be seen in Figure 4, in combination with Figure 7, wick retaining insert 8 is provided with a clamping zone 18 for clamping the wick in the insert which includes, in this example, five clamping fingers 17. These clamping fingers 17 extend in the direction of the longitudinal axis of the wick retaining insert and are separated from each other circumferentially by gaps 19.

As can be seen in particular in Figures 4, 6, and 7, clamping steps 21 are formed on clamping fingers 17 on an inside insert wall 20. The clamping steps 21 of the clamping fingers 17 adjoining each other are offset relative to each other in the longitudinal direction of the wick retaining insert. Every other clamping step 21 is approximately at the same level as related to the longitudinal axis of the wick retaining insert. With this kind of design of the clamping steps 21 their gradation is downward from inside to outside.

As can best be seen in Figures 2 and 7, the illustrated container neck 3 has two different diameter zones 22, 23 formed by simple gradation 24 in a change-over zone between diameter zones 22, 23. Diameter zone 22 constitutes an upper, greater diameter zone, and diameter zone 23 constitutes a lower, smaller diameter zone. As can be seen in particular in Figure 7, an insertion bevel 25 is provided in the area of the gradation 24.

A clamping connection 26 is created between wick retaining insert 8 and inside container neck wall 15, caused by the different diameter zones 22, 23 at clamping zone 18 of the insert. This clamping connection is formed by deformation of the clamping fingers 17 against inside container neck wall 15 according to the invention to clamp and fix the inserted wick 10 so that the wick is secured against being pulled out of the container 1, as explained in further detail below.

Before wick retaining insert 8 is inserted into container opening 4 of container neck 3, it is in the condition shown in Figure 4. In this condtion, wick 10 can simply be inserted through holding ring wick opening 9 of the insert. When the wick is inserted in wick retaining insert 8 the assembly is pressed into container opening 4 and container neck 3, whereby the clamping fingers 17 of the wick retaining insert 8 pass through the upper diameter zone 22 through the insertion bevel 25 into the smaller diameter zone 23, so that they care deformed in the direction of the wick 10 as can be seen in particular in Figure 7. As a result, the step edges of clamping fingers 17 are pressed against the wick 10 so that the wick 10 is prevented by a certain resistance force from being pulled out. The deformation of the clamping fingers 17 at clamping

zone 18 is effected by gaps 19 providing sufficient room for the deformation of the clamping fingers 17 in the direction of the wick 10.

Clamping connection 26 is designed in form of a clamping cone connection, whereby wick retaining insert 8 is preferably made of a plastic material and the clamping fingers are preferably elastically deformable. However a plastic deformation is also a possible alternative.

As can further be seen in Figure 7, there is an upper wick retaining insert zone 28 that starts above the broken line Figure 7 and is pressed into container opening 4 by means of a press fit. To facilitate the insertion of wick retaining insert 8 at the beginning of the snap-fitting process, an insertion bevel 29 is formed across from the shoulder 11. To facilitate the insertion of the wick 10 into the wick retaining insert 8, insertion bevels 30, 31 are also provided.

While a preferred embodiment of the invention has been described using specific terms, such description is for illustrative purposes only, and it is to be understood that changes and variations may be made without departing from the spirit or scope of the following claims.